Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

In the Matter of Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band	ET Docket No. 02-380

REPLY COMMENTS OF MICROSOFT CORPORATION

Microsoft believes that robust, reasonably priced broadband networks are essential to the development of new software, applications, and services that improve productivity, enrich personal lives, and deliver benefits to every sector of society. We have often argued that innovative wireless technologies operating in "unlicensed" bands[1] can help make this happen.[2] We have also said that "underlay" operations could be an important component of tomorrow's unlicensed broadband networks – particularly in lower-band spectrum (such as the television broadcast bands) where longer-distance and through-the-wall transmissions better enable rural service and the development of mesh networks. Microsoft believes that examining the technical feasibility of unlicensed operations in the broadcast and 3650 MHz bands is a critical part of the

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1 As a legal matter, the use of these bands is licensed by rule rather than by individual license – the use of the bands is not really "unlicensed."

2 *See*, *e.g.*, Comments of Microsoft Corporation in ET Docket No. 02-135 (filed Jan. 27, 2003) ("Microsoft SPTF Comments"); Comments of Microsoft Corporation in WT Docket No. 02-381 (filed Feb. 3, 2003).

Commission's broader review of the nation's spectrum policy, and therefore supports the Commission's call for a robust and expeditious technical analysis of the issue.[3]

A wide range of commenters, including Intel, AT&T, Bluetooth, ITIC, Intersil, the New America Foundation *et al.*, Shared Spectrum Company, the SDR Forum, and the Wi-Fi Alliance, all share Microsoft's views on the potential of unlicensed wireless technologies. And many share Microsoft's hope that unlicensed devices may over time provide an additional broadband choice to some consumers.[4] Others have pointed out that the broadcast and 3650 MHz bands are particularly suitable for unlicensed use, and that unlicensed devices can coexist with incumbents in those bands.[5]

Admittedly, not all commenters were so enthusiastic. Some raised concerns that unlicensed devices might interfere with their operations. Microsoft recognizes these concerns, and anticipates that a robust and thorough technical analysis will help address them. It is our expectation that the engineering record will demonstrate that unlicensed devices can share spectrum with broadcasters, public safety operations, and other users of the bands.

A handful of other commenters, however, do not raise interference issues; they just argue that allowing unlicensed underlay operations would be either unlawful or bad public policy. These commenters are mistaken as a matter of law. And the market has already demonstrated that they are wrong as a matter of policy.

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3 *Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band*, Notice of Inquiry, 17 FCC Rcd. 25,632 (2002) ("*Notice*").

4 *See*, *e.g.*, AT&T Comments at 3.

5 *See*, *e.g.*, Intel Comments at 6; New America Foundation *et al*. Comments at 3 (both discussing the suitability of broadcast bands for unlicensed uses).

I. ROBUST UNLICENSED TECHNOLOGY CAN AVOID HARMFUL INTERFERENCE

Unlicensed devices operating in the broadcast and 3650 bands must protect incumbents – and above all, the public safety community. This is the central focus of this *Inquiry*, and is entirely appropriate. Despite the concerns raised by some, the record to date indicates that unlicensed operations should be able to coexist with incumbent operations.

Broadcasters assert that "[a]llowing unlicensed devices into the broadcast band at this time would pose serious risks to the integrity of over-the-air broadcasting in general and to the success of the digital transition in particular . . . ."[6] The engineering data in the record, however, suggests otherwise. Intel, for example, points out that:

- Use of the television broadcast bands is well understood.
- The fixed nature of TV transmitters makes sharing much easier.
- Broadcast channels are frequently vacant.
- There is a "huge body of data" characterizing, analyzing, and profiling the broadcast television environment.
- The signal strength contours of service areas and receiver design and operation are well understood.
- Extensive DTV research, deployment, and five years of operational experience are available.
- Unlicensed devices will employ interference mitigation techniques such as dynamic frequency selection, dynamic power control, and smart antennas.

Intel concludes that "[s]haring spectrum in this well-defined, stable environment is a manageable task . . . ."[7]

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[6] MSTV Comments at ii.

[7] Intel Comments at 7.

Intel also provides a technical analysis of potential unlicensed operations in the television broadcast bands in the San Francisco Bay Area (chosen because of its three overlapping television coverage areas). This analysis concludes that, "even in apparently congested areas significant white spaces exist that would permit unlicensed devices to provide valuable new services . . . [and that] a digital broadband use appears suitable to a sharing scenario in the San Francisco Bay Area."[8] Microsoft concurs with Intel and others who believe that sharing between unlicensed devices and television broadcasters is possible.[9]

Providers of Specialized Mobile Radio services, Land Mobile Radio Systems, dispatch services, and others – including the public safety community – also raise interference concerns. They say that unlicensed sharing with mobile services poses a more difficult technical challenge than sharing with broadcasters.[10] While the mobile environment is indeed more complex, Microsoft believes a complete record is likely to reflect that unlicensed technology is capable of successfully sharing spectrum with mobile services.

Indeed, protecting mobile devices in the broadcast bands may be less difficult than solving related interference issues that have already been addressed in other bands. As the Commission acknowledged in an NPRM adopted only yesterday, industry and the Department of Defense recently concluded that unlicensed devices could share spectrum with transportable

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8 *Id.* at 9.

9 *See*, *e.g.*, SDR Forum Comments at 5 (noting that advanced radio technologies already perform many of the spectrum management techniques required for sharing with broadcasters).

10 *See* American Mobile Telecommunications Association Comments at 3; APCO Comments at 2; Land Mobile Communications Council Comments at 6; Los Angeles County Comments at 4. One commenter put it colorfully: "The FCC may be correct that the [unlicensed] devices would hear and avoid a megawatt broadcast station that transmits continuously . . . [but] the result may be different if they have to avoid interfering with a .6 watt portable that is being used while in transmit in a vehicle." Atlantic Telecommunications Comments at 3.

military radar in the 5 GHz band.[11] Unlicensed devices in the 5 GHz band will incorporate dynamic frequency selection, allowing them to sense co-channel mobile military radar operations and switch transmissions to another frequency to avoid interference. Unlicensed transmitters in that band will also employ transmit power control, allowing each transmitter to use only the power necessary to reach the receiver it is trying to reach, and to scale down power when less power is needed. These technologies will allow unlicensed devices to coexist with military radar systems that are enormously sensitive to interference and, because of the importance of their function, can afford little degradation to their operations. Microsoft believes that these and related technologies should be able to facilitate sharing between unlicensed devices and incumbent operations – fixed or mobile – in the broadcast and 3650 MHz bands.

II. PERMITTING UNLICENSED UNDERLAY OPERATIONS WOULD BE BOTH LAWFUL AND WISE PUBLIC POLICY

As noted above, many comments raise technical – though probably resolvable – concerns about interference from unlicensed devices. Others, however, argue that permitting unlicensed use of these bands would be either unlawful or unsound public policy. Microsoft believes that, as long as legitimate interference concerns can be addressed, the Commission should not slow the introduction of unlicensed devices into these bands based on these policy and legal arguments.

A. LICENSING BY RULE DOES NOT VIOLATE THE COMMUNICATIONS ACT

Cingular claims that "[t]he Commission may not allocate any spectrum in the TV broadcast or 3650 MHz bands to *unlicensed* devices because such an allocation would violate the Act."[12] It then goes on to argue: (1) that Section 301's prohibition on radio transmission

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[11] *See FCC Proposes Additional Spectrum for Unlicensed Use*, News release, ET Docket No. 03-122 (rel. May 15, 2003).

[12] Cingular Comments at 2 (emphasis in original).

"except . . . with a license" prohibits unlicensed operations;[13] (2) that 65-plus years of unlicensed operations has been based on an erroneous assumption about the jurisdiction of the Communications Act;[14] and (3) that "it would be contrary to law for the Commission to permit additional unlicensed operations . . . ."[15]

What Cingular is really saying is not simply that *additional* unlicensed operations would be illegal, but that all *existing* unlicensed operations are illegal.[16] This position, if pursued, would cause a major disruption to the US economy and to the day-to-day lives of most Americans. It would also create a bureaucratic nightmare of unimaginable proportions. Potentially every user of any device that radiates radiofrequency energy, whether intentionally, unintentionally, or incidentally, would be required to obtain an individual license from the Commission. Before anything else happened, perhaps, the Commission would collapse in paperwork – following which all of the industries that rely on the current regulatory regime would collapse.

Fortunately, Cingular's contention is unavailing. The plain language of Section 301 of the Communications Act requires only that spectrum use be *licensed* – not that it be

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13 *Id.* at 3 (citing 47 U.S.C. § 301).

14 *Id.* at 3-4 (claiming that adoption of the rules for unlicensed devices in 1938 "was premised on the notion that Section 301 only applied to interstate transmissions and that low-power operations could be permitted on an unlicensed basis because such transmissions generally lacked an interstate component").

15 *Id.* at 4.

16 Cingular knows this, as it cites to a petition for reconsideration filed by the American Radio Relay League ("ARRL") claiming that the Commission "has no jurisdiction . . . to authorize by rulemaking the operation of unlicensed devices which have significant potential for interference to licensed radio services" and that, "in this proceeding *and other recent Commission proceedings*, this statutory obligation [to authorize all such radio services through individual licensing] has not been properly discharged." *Id.* at 4 (*citing* ARRL Petition for Reconsideration in ET Docket No. 98-156 at i, 10 (filed Feb. 13, 2002)) (emphasis added). There is no legal basis for limiting ARRL's claims to only those unlicensed devices that "have significant potential for interference." *See* Agere Systems Inc. *et al.* Opposition to ARRL's Petition for Reconsideration, ET Docket No. 98-156, at 4-5 (filed May 31, 2002).

"individually" licensed. Section 302 of the Act also provides a grant of authority sufficiently broad to support licensing by rule.[17] Congress has been aware of licensing by rule for at least thirty years, and has not objected.[18] And courts have specifically approved a similar licensing regime adopted by the Commission under Title II of the Communications Act.[19] Part 15 of the Commission's rules, which "sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an *individual* license," is thus perfectly legal.[20] So too are existing and future unlicensed devices.

B. UNLICENSED UNDERLAY OPERATIONS WILL PROMOTE BROADBAND NETWORKS

The Association for Maximum Service Television, Inc. *et al.* ("MSTV") takes a different tack: rather than arguing that unlicensed devices are illegal, it argues that underlay unlicensed operations in broadcast bands isn't a good idea.[21] It concedes that unlicensed devices have been successful in dedicated bands, but predicts they will be less so in underlay bands.[22] And it suggests that a listen-before-talk spectrum etiquette will price unlicensed devices at approximately 2.25 times the price of comparable devices without such technology, so that

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17 *See* 47 U.S.C. § 302a (providing that "[t]he Commission may . . . make reasonable regulations (1) governing the interference potential of devices which in their operation are capable of emitting radio frequency energy by radiation, conduction, or other means in sufficient degree to cause harmful interference to radio communications . . .").

18 *See* S. Rep. No. 90-1276 (1968), *reprinted in* 1968 U.S.C.C.A.N. 2486, 2478 (Commerce Committee report noting – and not objecting to – the fact that the Commission had established technical standards for various radiation devices that had not been individually licensed).

19 *See Lincoln Tel. & Tel. Co. v. FCC*, 659 F.2d 1092, 1101 (D.C. Cir. 1981) (approving Commission policy of granting blanket construction and operating authority to domestic carriers).

20 47 C.F.R. § 15.1(a) (emphasis added).

21 Specifically, MSTV claims that, "a cost-benefit analysis (so long as it recognizes the unique value of broadcasting) here demonstrates that the significant costs of allowing unlicensed devices into the broadcast spectrum in the near term would far exceed the limited benefits that would accrue." MSTV Comments at 14.

22 *Id.* at 13-17; app. B (John Haring and Jeffrey H. Rohlfs, *Permitting Unlicensed Devices on Broadcast Spectrum During the DTV Transition: Substantial Costs and Risks, Largely Speculative Benefits*).

manufacturers will either choose not to operate in bands requiring such etiquettes, or will "cut corners" at the expense of broadcasters.[23]

The unfolding unlicensed marketplace does not bear out MSTV's assertions. First, it assumes that only unlicensed devices operating in "underlay" bands will incorporate spectrum-sharing technology, which is incorrect. Second, it does not take into account the advantages that will accrue to unlicensed devices operating in bands with better propagation characteristics. Third, manufacturers have *already decided* it worth their while to produce devices with listen-before-talk capability, and indeed have devoted a great deal of resources to developing such devices and securing the legal authority to deploy them. Evidently, these manufacturers believe there is a market opportunity for such devices. Moreover, because unlicensed devices will already use such technology at 5 GHz, allowing similar devices to operate in the broadcast bands will only increase economies of scope and scale – making devices cheaper in *both* bands.

C. UNLICENSED DEVICES SHOULD NOT BE LIMITED TO THE UPPER BANDS

Finally, Cingular suggests that, rather than allowing unlicensed operations in the broadcast or 3650 MHz bands, "any new unlicensed bands ideally should be located above 5 GHz . . . ."[24] And Ericsson argues that unlicensed bands should only be allocated at 5 GHz, where unlicensed use is being allocated internationally.[25]

Microsoft's support for additional unlicensed spectrum at 5 GHz has been clear and consistent. And Microsoft certainly will not rule out the possibility that, as technology improves, unlicensed products and services may become commercially viable at even higher frequencies.

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[23] *Id.* at 3-4, app. A (Stuart J. Lipoff, *Exploring the Feasibility of Sharing TV Band Spectrum with Unlicensed RF Devices*).

[24] Cingular Comments at 12.

[25] Ericsson Comments at 3-4.

But it is particularly important that the Commission find lower band spectrum – such as television broadcast spectrum – for unlicensed uses. Lower band spectrum has better propagation characteristics, allowing longer-distance and "through-the-wall" transmissions.[26] For rural areas, for the development of mesh networks, and for urban buildings where new wiring is prohibitively expensive, these propagation characteristics could make all the difference between broadband service being available or not.

In the end, unlicensed broadband service should be offered over a variety of frequencies, depending on variables such as applications and geography. The television broadcast and 3650 MHz bands are an important part of the answer, as are the 5 GHz and other bands. Therefore, the Commission should reject calls to abandon any of them.

[26] *See* New America Foundation *et al.* Comments at 6-7 (describing broadcast spectrum as "beachfront" spectrum, and noting that "the spectrum allocated to radio and TV broadcasters is extremely well suited for passing through objects such as buildings, weather, and foliage").

CONCLUSION

Unlicensed wireless devices have already had an enormous positive impact on schools, businesses, and consumers. Microsoft believes that unlicensed operations in the broadcast and 3650 MHz bands can make an important contribution to America's broadband future. As all commenters in this proceeding recognize, unlicensed operations in these bands must coexist with incumbent users. Therefore, the Commission should examine and resolve the technical issues, reject the policy arguments, and move forward expeditiously with this proceeding.

Respectfully submitted,

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